

Figure 51: Histogram of Total Dissolved Solids Concentrations for Period Between 6/29/01 and 9/06/01

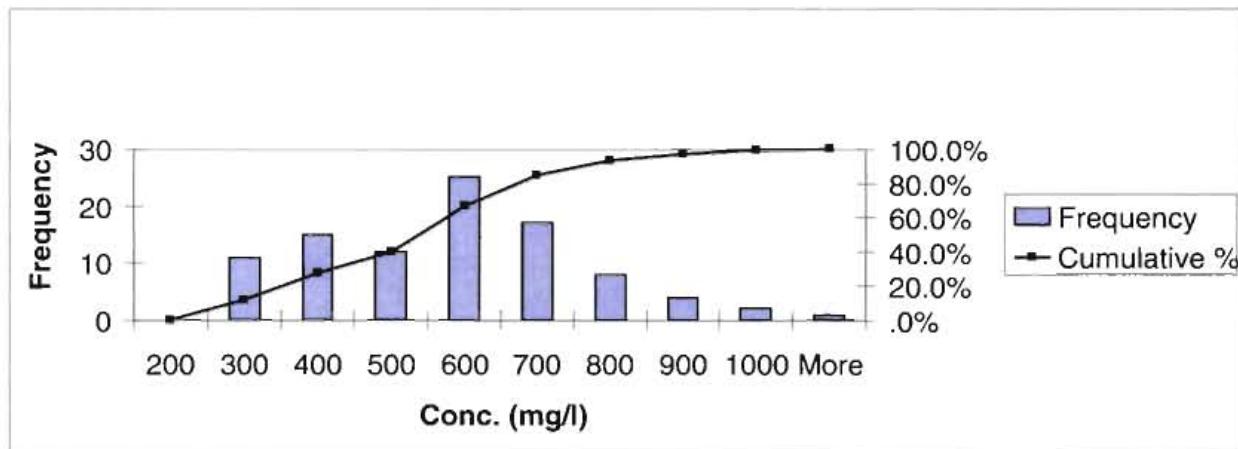


Figure 52: Histogram of Total Dissolve Solids Concentrations for Period Between 9/06/01 and 4/06/02

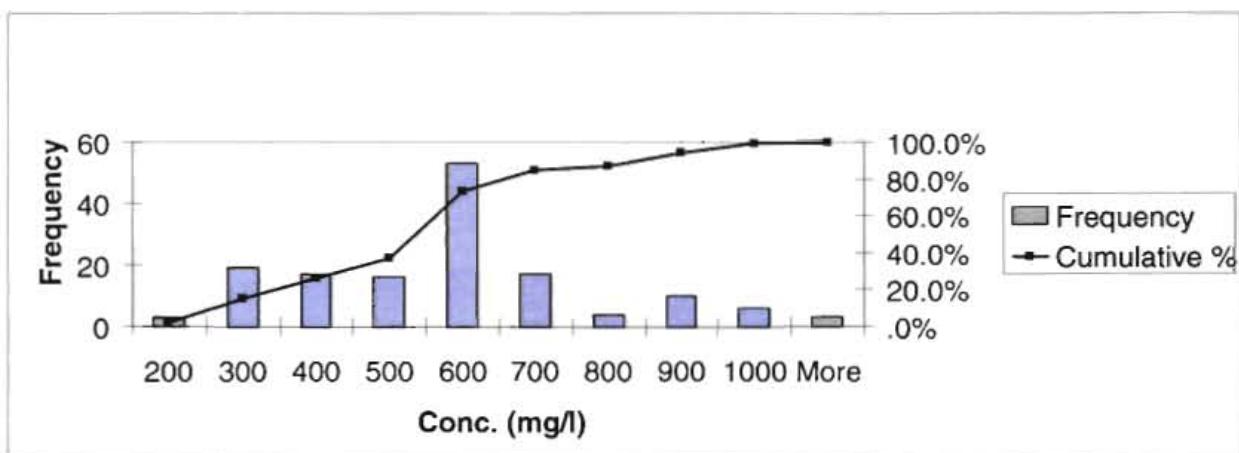


Figure 53: Histogram of Total Dissolve Solids Concentrations for Period Between 04/06/02 and 10/09/02

Table 2: Statistical Characterization of the Mean Values of Measured Environmental Parameters

Statistical Characterization for Dissolved Oxygen			
	1st Irrigation season	non -irrigation season	2nd irrigation season
Mean	6.775	6.206	6.533
Variance of the mean	0.116	0.057	0.033
Standard Deviation of the mean	0.321	0.227	0.182
Confidence Level (95.0%)	0.684	0.475	0.359
Observations	52	94	146
Statistical Characterization of Groundwater Temperature			
	1st Irrigation season	non -irrigation season	2nd irrigation season
Mean	15.523	13.337	14.108
Variance of the mean	0.045	0.016	0.010
Standard Deviation of the mean	0.212	0.128	0.102
Confidence Level (95.0%)	0.421	0.254	0.202
Observations	86	95	148
Statistical Characterization for NO <sub>3</sub> -NO <sub>2</sub> Conc.			
	1st Irrigation season	non -irrigation season	2nd irrigation season
Mean	5.675	4.998	6.895
Variance of the mean	0.369	0.153	0.226
Standard Deviation of the mean	0.608	0.391	0.476
Confidence Level (95.0%)	1.209	0.780	0.940
Observations	82	93	148
Statistical Characterization for Groundwater pH			
	1st Irrigation season	non -irrigation season	2nd irrigation season
Mean	7.886	8.146	9.303
Variance of the mean	0.003	0.001	0.002
Standard Deviation of the mean	0.050	0.031	0.049
Confidence Level (95.0%)	0.100	0.062	0.097
Observations	86	93	147
Statistical Characterization for total Dissolved Solids Conc.			
	1st Irrigation season	non -irrigation season	2nd irrigation season
Mean	492.326	540.316	530.543
Variance of the mean	393.727	355.374	283.556
Standard Deviation of the mean	20.982	18.851	16.839
Confidence Level (95.0%)	38.441	37.430	33.278
Observations	86	95	148

Table 3: Comparison of Parameter Means Using the Z Test

Test of Means for Dissolved Oxygen Conc.			
	1st Irrigation to non - irrigation season	1st irrigation season to 2nd irrigation season	non-irrigation season to 2nd irrigation season
z	1.366	0.627	1.087
z Critical two-tail ( $\alpha = 0.05$ )	1.960	1.960	1.960
Test of Means for Groundwater Temperature			
	1st Irrigation to non - irrigation season	1st irrigation season to 2nd irrigation season	non-irrigation season to 2nd irrigation season
z	8.834	6.011	4.710
z Critical two-tail ( $\alpha = 0.05$ )	1.960	1.960	1.960
Test of Means for $\text{NO}_3\text{-NO}_2$ Nitrogen Conc.			
	1st Irrigation to non - irrigation season	1st irrigation season to 2nd irrigation season	non-irrigation season to 2nd irrigation season
z	0.936	1.930	3.080
z Critical two-tail ( $\alpha = 0.05$ )	1.960	1.960	1.960
Test of Means for pH			
	1st Irrigation to non - irrigation season	1st irrigation season to 2nd irrigation season	non-irrigation season to 2nd irrigation season
z	4.382	20.094	19.814
z Critical two-tail ( $\alpha = 0.05$ )	1.960	1.960	1.960
Test of Means for Total Dissolved Solids Conc.			
	1st Irrigation to non - irrigation season	1st irrigation season to 2nd irrigation season	non-irrigation season to 2nd irrigation season
z	1.753	1.470	0.387
z Critical two-tail ( $\alpha = 0.05$ )	1.960	1.960	1.960

As part of the measurement efforts, the measurements reported by Heritage College were compared with two other independent laboratories. From January of 2002 until the end of April 2002, duplicate samples were sent to Murphey Analytical Laboratories, Inc. for analysis of  $\text{NO}_3\text{-NO}_2$  nitrogen. At least one of every twenty determinations was subjected to duplicate analysis. The results of these tests are shown in Table 4. Because of the wide disparity between Heritage

College and Murphey Analytical Laboratories, Inc., a cross calibration of standards was conducted on January 31, 2002. Comparisons made after the cross calibration indicated better agreement between measurements made by the two institutions.

From May of 2002 until September 2002, duplicate samples were sent to Cascade Analytical, Inc. At least one of every twenty determinations was subjected to duplicate analysis. The results of these tests are shown in Table 5. Comparing the results of these inter-laboratory measurements indicates that the measurements made by Heritage College were biased high by between 1 and 2 parts per million (mg/l) on average compared to the other two institutions.

Table 4: Quality Assurance Data, Inter-laboratory Comparison with Murphey Analytical Laboratories

Sample Location	Date Sampled	Total Nitrite/Nitrate	Murphey Anal. Lab. Inc.	Heritage College	diff	diff <sup>2</sup>	diff <sup>2</sup> /mean
			Total Nitrite/Nitrate				
GW10	1/15/2002	.4 ppm		3.3 ppm	-2.90	8.41	4.55
GW22	1/15/2002	3.0 ppm		8.6 ppm	-5.60	31.36	5.41
GW26	1/15/2002	1.4 ppm		2.0 ppm	-0.60	0.36	0.21
GW42 standard 10 ppm	1/15/2002	.6 ppm		11.3 ppm	10.70	114.49	19.24
standard 3 ppm	1/24/2002	11.8 ppm					
standard 1 ppm	1/24/2002	3.2 ppm					
GW10	1/31/2002	1.0 ppm		3.3 ppm	-2.30	5.29	2.46
GW26	1/31/2002	2.5 ppm		2.0 ppm	0.50	0.25	0.11
GW26	1/31/2002	.7 ppm		2.0 ppm	-1.30	1.69	1.25
GW10	3/15/2002	3.3 ppm		3.3 ppm	0.00	0.00	0.00
GW18	3/15/2002	.6 ppm		0.25 ppm	0.35	0.12	0.29
GW6	4/9/2002	2.0 ppm		3.3 ppm	-1.30	1.69	0.64
GW45	4/9/2002	1.9 ppm		10.0 ppm	-8.10	65.61	11.03
Average					-2.90	20.84	4.11
Average After Cross Reference of Standards					-1.74	10.66	2.25

Table 5: Quality Assurance Data, Inter-laboratory Comparison with Cascade Analytical Inc.

Sample Location	Date Sampled	Total Nitrite/Nitrate	Heritage College			
			Total Nitrite/Nitrate	diff	diff <sup>2</sup>	diff <sup>2</sup> /mean
GW42	5/14/2002	17.1 ppm	18.0 ppm	-0.90	0.81	0.05
GW10	5/14/2002	4.66 ppm	4.0 ppm	0.66	0.44	0.10
GW18	5/14/2002	< .07 ppm	0.25 ppm	-0.18	0.03	0.20
GW14	5/22/2002	10.6 ppm	11.3 ppm	-0.70	0.49	0.04
GW22	5/22/2002	10.1 ppm	18.0 ppm	-7.90	62.41	4.44
GW28	5/22/2002	4.5 ppm	8.0 ppm	-3.50	12.25	1.96
GW28	6/5/2002	5.24 ppm	8.0 ppm	-2.76	7.62	1.15
GW22	6/5/2002	12.2 ppm	15.0 ppm	-2.80	7.84	0.58
GW 14	6/5/2002	12.0 ppm	14.0 ppm	-2.00	4.00	0.31
GW15	6/27/2002	.770 ppm	1.0 ppm	-0.23	0.05	0.06
GW2	6/27/2002	3.25 ppm	3.33 ppm	-0.08	0.01	0.00
GW1	6/27/2002	18.2 ppm	16.5 ppm	1.70	2.89	0.17
GW17	7/11/2002	1.24 ppm	2.0 ppm	-0.76	0.58	0.36
GW5	7/11/2002	1.00 ppm	1.0 ppm	0.00	0.00	0.00
GW2	7/11/2002	3.11 ppm	3.33 ppm	-0.22	0.05	0.02
GW39	7/24/2002	2.03 ppm	3.0 ppm	-0.97	0.94	0.37
GW13	7/24/2002	1.90 ppm	2.33 ppm	-0.43	0.18	0.09
GW4	7/24/2002	4.74 ppm	3.0 ppm	1.74	3.03	0.78
GW52	8/12/2002	13.8 ppm	16.0 ppm	-2.20	4.84	0.32
GW53	8/12/2002	13.5 ppm	12.0 ppm	1.50	2.25	0.18
GW33	8/12/2002	.61 ppm	0.6 ppm	0.01	0.00	0.00
GW8	8/20/2002	10.3 ppm	14.0 ppm	-3.70	13.69	1.13
GW 44	8/20/2002	3.72 ppm	5.3 ppm	-1.58	2.50	0.55
GW17	8/20/2002	1.34 ppm	2.0 ppm	-0.66	0.44	0.26
GW34	9/11/2002	3.79 ppm	6.6 ppm	-2.81	7.90	1.52
GW35	9/11/2002	3.80 ppm	1.3 ppm	2.50	6.25	2.45
GW36	9/11/2002	5.75 ppm	8.6 ppm	-2.85	8.12	1.13
GW3	9/17/2002	4.96 ppm	4.5 ppm	0.46	0.21	0.04
GW2	9/17/2002	3.03 ppm	5.5 ppm	-2.47	6.10	1.43
GW5	9/17/2002	.95 ppm	1.0 ppm	-0.05	0.00	0.00
Average				-1.04	5.20	0.66

## **Appendix A**

### **Consent Forms**

Heritage College  
.1 Science and Math Department  
3240 Fort Road  
Toppenish, Washington 98948-9562  
509-865-8551

2001 Well-Water Quality Survey  
Participating Household Sampling Authorization

I, \_\_\_\_\_, residing at \_\_\_\_\_, hereby authorize Heritage College to sample my household water on a regular basis for the purposes of conducting a survey of regional water quality. I give my permission for survey team members to enter onto my property in order to obtain the necessary water samples. I give my permission for regular sampling, not more than once a week, to be conducted over the course of the study. I understand that any information gathered might become public knowledge, and furthermore, that my name and street address will not be released with that information.

Signed: \_\_\_\_\_ Dated: \_\_\_\_\_

(Adult member of participating household)

Signed: \_\_\_\_\_ Dated: \_\_\_\_\_

(Survey team member)

Signed: \_\_\_\_\_ Dated: \_\_\_\_\_

(Survey team member)

Colegial de Herencia	Heritage College
.1 El Departamento de las Ciencias y Matemáticas	Science & Math
Department	
3240 Fort Road	3240 Fort Road
Toppenish, WA 98948-9562	Toppenish, WA 98948-9562
509-865-8551	509-865-8551

.2 La Autorización de Probar de Casa que participa

Yo, \_\_\_\_\_, residir en \_\_\_\_\_, autoriza el Colegio de la Herencia para probar mi agua del casa en una base regular para los propósitos de conducir una inspección de la calidad regional de agua. Doy mi permiso para miembros de equipo de inspección para entrar en mi propiedad para obtener las muestras necesarias de agua. Doy mi permiso para el muestreo regular, no más de una vez una semana, para ser conducida sobre el curso del estudio. Entiendo que información reunión quizás llegue a ser el conocimiento público, y además, que mi dirección de nombre y calle no se liberará con esa información.

Firmado: \_\_\_\_\_ Pasado de moda: \_\_\_\_\_  
(El miembro adulto de participar la casa)

Firmado: \_\_\_\_\_ Pasado de moda: \_\_\_\_\_  
(Inspeccione a miembro de equipo)

Firmado: \_\_\_\_\_ Pasado de moda: \_\_\_\_\_  
(Inspeccione a miembro de equipo)

**Appendix B**  
**Field Sampling Protocol**

P/T Alkalinity Protocol.....1

Use LaMotte Alkalinity Test Kit Model NCL Code 4533\_DR, reagents and acid washed glassware, small test tubes and Direct Reading Titrator Model NCR Code 0382.

1. Fill sample bottle with sample water.
2. Fill titrating tube (0647) to 5.0 mL line with water from the sample bottle.
3. Add one Phenolphthalein Tablet (T-2246). Cap and shake until tablet disintegrates.
4. If solution does not turn red, P Alkalinity is 0. If solution turns red, proceed to the next step.
5. Fill Direct Reading Titrator (0382) with Alkalinity Titration Reagent B (4493). Insert Titrator into center hole of the titration cap.
6. While gently swirling tube, slowly press plunger to titrate until red color disappears. Read test result where plunger tip meets Titrator scale.
7. If plunger tip reaches the bottom line in the Titrator scale (200ppm) before the color change occurs, refill the Titrator and continue the titration. When recording test results, be sure to include the value of original amount of reagent dispensed (200 ppm). Do not move Titrator plunger after the P Alkalinity endpoint has been obtained, as the T Alkalinity titration is a continuation of the P Alkalinity titration.
8. Being careful not to move plunger, remove Titrator and titration tube cap from titration tube containing sample that was titrated in steps 5 and 7.
9. Add one BCG-MR Tablet (T-2311). Cap and shake until tablet disintegrates. Solution should turn green -blue.
10. Reinsert the Titrator in cap and continue titration until the color changes from green-blue to pink. Report alkalinity as CaCO<sub>3</sub>. Be sure to include in test results value the total amount of titration reagent dispensed.
11. If only Total Alkalinity is to be tested perform steps 1,2, 9, 10, and 11 only. Use a full Titrator in Step 10.

Dissolved Oxygen Protocol.....2

Use LaMotte Dissolved Oxygen Test Kit Model NCL Code 7414, reagents and glassware, small test tubes and Direct Reading Titrator Model NCR Code 0377. A check to the Sodium Thiosulfate 0.025N is to be done on the day of sampling as follows:

1. At the beginning of the sampling day, using a 10 mL graduated cylinder to add 15 mL of Deionized Water to the titration tube (0299).
2. Using a Direct Reading Titrator, 0-1 Range (0376) to add 2 mL of Potassium Bi-iodate (7346)
3. Add 2 drops of Sulfuric Acid, 5N (8517WT).
4. Use the 0.1 g spoon (0699) to add 0.2 g Potassium Iodide Crystals (68909).
5. Swirl to mix. Solution will turn yellowish brown.
6. Fill another Direct Reading Titrator (0376) with Sodium Thiosulfate Solution 0.025N (4160)
7. While gently swirling the tube, add Sodium Thiosulfate, 0.025N until the color fades to pale yellow. It will be necessary to refill the Direct Reading Titrator.
8. Add 3 drops of Starch Indicator Solution (4170WT). The solution will turn blue.
9. Continue adding Sodium Thiosulfate, 0.025N until the blue color disappears and the solution is colorless.
10. Read test result where the plunger tip meets the Titrator. Include the value of the original amount dispensed (1 mL). If reading is 2.0 +/- mL, the Sodium Thiosulfate 0.025N (4169) is satisfactory. If not, discard and replace with new reagent.

Dissolved Oxygen Protocol Continued.....<sup>2</sup>

For each sample carryout the procedure as follows:

1. Rinse, then fill acid washed sample bottle with sample water and then cap bottle.
2. Remove cap and immediately add 8 drops of Manganese Sulfate Solution (4146) and 8 drops of Alkaline Potassium Iodide (7166).
3. Cap the bottle and mix by inverting several times. A precipitate will form.
4. Allow the precipitate to settle below the shoulder of the bottle.
5. Either add 1.0 g of Sulfamic Acid (0697) if using kit 7414 or 8 drops of Sulfuric Acid 1:1 (6141) if using kit 5860.
6. Cap and gently invert the bottle to mix the contents until the precipitate and the reagent have totally dissolved. The solution will be clear yellow to orange if the sample contains oxygen.
7. Fill the titration tube (0299) to the 20 mL line with the fixed sample prepared in the previous step. Cap the tube.
8. Depress the plunger of the Titrator and then insert the Titrator into the plug of the top of the Sodium Thiosulfate, 0.035N (4160) titrating solution.
9. Invert the bottle and slowly withdraw the plunger until the bottom of the plunger is opposite the zero mark on the scale. If small air bubbles appear in the Titrator barrel, expel them by partially filling the barrel and pumping the titration solution back into the reagent container. Repeat until bubbles disappear.
10. Turn the bottle upright and remove the Titrator.
11. Invert the tip of the Titrator into the opening of the titration tube cap.
12. Slowly depress the plunger to dispense the titrating solution until the yellow-brown color changes to a very pale yellow. Gently swirl the tube during the titration to mix the contents.
13. Carefully remove the Titrator and cap. Do not disturb the Titrator plunger.
14. Add 8 drops of Starch Indicator Solution (4170WT). The sample should turn blue
15. Cap the titration tube. Insert the tip of the Titrator into the opening of the titration tube cap.
16. Continue titrating until the blue disappears and the solution becomes colorless.
17. Record the result where the titrator tip meets the scale. Record as ppm Dissolved Oxygen, Each minor division on the Titrator scale equals 0.2 ppm.

Nitrate Protocol.....3

Low-Mid-High Range Method  
(0 – 20.00 ppm Nitrate Nitrogen)

Use LaMotte Nitrate Test Kits Model NCL Code 3615 and Model NCR Code 3110 for equipment, reagents and acid washed glassware, small test tubes and Octet Comparator contained in Test kit Model NCR Code 3110, large test tube contained in Test kit Model NCL Code 3615.

1. Fill sample bottle with sample water.
2. Fill small test tube #1 to the 2.5 mL line with water from the sample bottle. Dilute to second line (5.0 mL) with Mixed Acid Reagent. Cap and mix.
3. Using the calibrated dropper provided, add 1.25 mL sample water to small test tube #2. Add distilled water to the 2.5 mL line. Dilute to second line (5.0 mL) with Mixed Acid Reagent. Cap and mix.
4. Using the calibrated dropper provided, add 1.25 mL sample water to large test tube #3. Add distilled water to the 5.0 mL line. Dilute to second line (10.0 mL) with Mixed Acid Reagent. Cap and mix.
5. Wait 2 minutes.
6. Use the 0.1 g spoon to add one level measure (avoid any excess) of Nitrate Reducing Reagent to each test tube.
7. The mixing procedure is extremely important. Cap tube. Invert tube slowly and completely 30 times in 1 minute to insure complete mixing.
8. Wait 10 minutes.
9. Insert each test tube, in turn, into the Octet Comparator. Match sample color to a color standard. Record as follows:  
Test tube #1: numeric value = ppm Nitrate-Nitrogen.  
Test tube #2: numeric value x 2 = ppm Nitrate-Nitrogen  
.1      Test tube #3: numeric value x 4 = ppm Nitrate-Nitrogen

To convert from Nitrate-Nitrogen ( $\text{NO}_3\text{-N}$ ) to Nitrate ( $\text{NO}_3$ ), multiply ppm Nitrate-Nitrogen by 4.4

pH Protocol.....5

Low-Mid-High Range Method  
(-1 to 15 pH)

Use Oakton pH Testr1 Model 35624-00 and acid washed glassware.

1. Fill sample bottle with sample water.
2. Remove electrode cap and press the on/off button to turn on
3. Dip the end of the electrode into the sample water.
4. Allow time for the Automatic Temperature Compensation to correct the readings for solution temperature changes.
5. Note the full reading once the display stabilizes.
6. Press on /off button to shut off
7. Clean electrodes by rinsing them in alcohol for 10 to 15 minutes.
8. Replace electrode cap.

**Phosphate Protocol.....5**

(1.0 ~ 10.00 ppm Phosphate)

Use LaMotte Phosphate Test Kit Model NCL Code 4410-H, reagents and acid washed glassware, small test tubes and Octet Comparator contained in Test kit Model NCR Code 4414.

1. Fill sample bottle with sample water.
2. Fill small test tube #1 to the 5.0 mL line with water from the sample bottle.
3. Use plain pipet to add 1.0 mL of VM Phosphate Reagent (4410).
4. Stopper and mix by inverting several times.
5. Wait 5 minutes.
6. Using the plain pipet (0352) to add 3 drops of Reducing Agent (6405). Cap and mix. Color develops in 10 seconds.
7. Insert tube into the Phosphate Comparator (4414). Match sample color to a color standard. Record as ppm ( $\text{PO}_4$ ).

TDS Protocol.....6

Low-Mid-High Range Method  
(0 – 1990 ppm TDS)

Use Oaktan TDS Model WD-35661-10 and acid washed glassware.

1. Fill sample bottle with sample water.
2. Remove electrode cap and press the on/off button to turn on.
3. Dip the end of the electrode into the sample water.
4. Allow time for the Automatic Temperature Compensation to correct the readings for solution temperature changes.
5. Note the full reading once the display stabilizes.
6. Press on /off button to shut off
7. Clean electrodes by rinsing them in alcohol for 10 to 15 minutes.
8. Replace electrode cap.

Temperature Protocol.....7

(0<sup>0</sup>-50<sup>0</sup> C)

Use an Enviro-Safe thermometer and acid washed glassware.

1. Remove thermometer from case.
2. Fill sample bottle with sample water.
3. Immediately submerge the tip of the thermometer into the sample.
4. Wait until stable temperature has been achieved and record the temperature to the nearest degree.
5. Rinse the thermometer with alcohol.
6. Replace it in the case.

## Total Coliform Protocol.....8

Use LaMotte Total Coliform Test Kit Model TC-5, reagents and acid washed glassware, small test tubes and Octet Comparator contained in Test kit Model NCR Code 4414.

1. Determine sample source, i.e., spigot, faucet, etc. Soak cotton ball or gauze with household alcohol and wipe entire water outlet area of spigot, faucet or test valve. Pay particular attention to faucet aerator screens and mixers.
2. Allow tap (cold water) to run 2 to 3 minutes or until the line is flushed.
3. Reduce tap water flow to a rate that will fill the Water Sample Bag slowly without splashing. Tear off the top of bag at scored line and pull tabs outward to open bag. Do not touch bag opening or inner lining.
4. Fill bag to 4 oz. fill line, pull wire ends to close and whirl bag 3 complete revolutions. Shake bag to dissolve tablet.
5. Remove all 5 tubes from the display package and remove caps.
6. Unwhirl bag and pull tabs outward to open bag. Fold one tape wire inward to form a spout. Carefully fill all 5 tubes to the 10 mL line with water sample. Replace caps tightly. Do not shake or mix.
7. Stand the carton upright and place all 5 tubes into the display package. All tube should now be standing vertically with the tablets at the bottom of the tube. Tablets should lie flat on bottom of tube.
8. Store tubes at room temperature, out of direct sunlight, for 30 to 36 hours. Air temperature should be fairly constant and between 70<sup>0</sup> to 85<sup>0</sup> F. Do not disturb, handle or shake tubes during the designated incubation time period.
9. Read positive results as follows:  
Indicator turns yellow  
Much gas bubbles evident within gelling substance  
Gel rises to surface of sample  
Substrate below gel is cloudy

10. Read negative results as follows:

Indicator remains red or turns yellow with few bubbles

Gelling substance remains on bottom of tube

Substrate above gelling substance should be clear

**Appendix C**  
**Quality Assurance Procedures**

Each of the methods used in this study is regularly calibrated. Unless otherwise noted, field methods are calibrated at the beginning of each sampling campaign and weekly during the campaign. All field calibration methods were adapted from *Globe Program Teachers Guide* (1997).

### **Calibration Procedure for Alkalinity**

1. Using a balance, weigh out 1.9 g of sodium bicarbonate and add it to a 500 mL graduated cylinder.
2. Fill the 500 mL graduated cylinder to the 500 mL mark with deionized water.
3. Pour the solution into a 500 mL beaker and stir it with a stirring rod until all of the sodium bicarbonate is dissolved.
4. Pour 15 mL from the beaker into a 100 mL graduated cylinder.
5. Rinse the 500 mL graduated cylinder with deionized water. Then, pour 15 mL of the solution containing sodium bicarbonate into the 500 mL graduated cylinder.
6. Fill the 500 mL graduated cylinder to the 500 mL mark with deionized water. This is the standard.
7. Run the total alkalinity protocol using the standard solution in place of a water sample. It should indicate an alkalinity of 68 mg/L as Ca CO<sub>3</sub>. Run a deionized water sample through the alkalinity protocol. It should read a value below 14 mg/L as CaCO<sub>3</sub>. If the alkalinity is off by more than the alkalinity change by one drop of the titrator, the calibration should be repeated.

### **Calibration Procedure for Dissolved Oxygen**

1. Rinse a 250 mL bottle twice with deionized water. Measure 100 mL of deionized water with a graduated cylinder.
2. Pour the water into the 250 mL bottle. Put the lid on tightly and shake it vigorously for 5 minutes.
3. Uncap the bottle and take the temperature of the water. Be sure the tip of the thermometer does not touch the bottom or sides of the bottle. Wait one minute before reading the temperature.
4. Record the temperature.
5. Follow directions to measure dissolved oxygen.
6. Look up saturation concentration of dissolved oxygen at the temperature of the water and compare with recorded value.
7. Values should agree within 0.4 ppm. If not, replace stock solutions and repeat calibration.

### **Calibration Procedure for NO<sub>3</sub>-N**

Prepare 100 mg /L stock solutions of potassium nitrate (KNO<sub>3</sub>) and 1 mL of chloroform per 500 mL of solution to preserve it. The standard solution for this calibration should be kept tightly capped and refrigerated. The label on the bottle should include the date on which the solution was prepared or purchased.

1. Dilute 100 mg/L standard to make 2 mg/L standard. Measure 10 mL of 100 mg/L standard solution using a 100 mL graduated cylinder. Pour this into a 500 mL acid washed beaker. Measure 490 mL of deionized water in a 500 mL graduated cylinder and add to the 500 mL beaker.
2. Follow the NO<sub>3</sub>-N protocol directions to measure the standard.
3. Record the value of the concentration. It should be within 1 mg/L. If the error is larger, new stock solutions must be made.

### Calibration Procedure for pH

Use prepared buffer solutions at pH 4, 7, and 10. The standard buffers for this calibration should be kept tightly capped and refrigerated. The label on the bottle should include the date on which the solution was prepared or purchased.

1. Rinse the electrode and area around it twice with deionized water using a squeeze bottle and blot dry with a soft tissue after each rinse. Rinse into a discard beaker or sink.
2. Turn the pH meter on. Push the CAL button to indicate that you will be calibrating the instrument.
3. Immerse the electrode in the pH 7.0 solution, making sure that the electrode is entirely immersed.
4. Gently stir the buffer with the electrode and wait for the display to stabilize. Once the reading is stabilized, press the HOLD/CON button to accept the value and complete the calibration.
5. Remove the pH tester from the buffer solution, rinse the electrode with distilled water, and blot dry with a soft tissue.
6. Repeat steps 2 through 5 using pH 4 and pH 10 buffers.
7. Set the tester aside on a paper towel, turn the meter off by pushing the on/off button and leave it off for 5 minutes.
8. Turn the pH meter on and directly measure the pH of each of the buffer solutions, rinsing the electrode with deionized water and drying with a soft tissue after each measurement.
9. Measurements must agree to within +/- 0.2 pH units or process must be repeated.

### Calibration Procedure for PO<sub>4</sub>

Prepare 100 mg /L (100 mg PO<sub>4</sub>/L) stock solutions of potassium nitrate (KH<sub>2</sub>PO<sub>4</sub>). The standard solution for this calibration should be kept tightly capped and refrigerated. The label on the bottle should include the date on which the solution was prepared or purchased. Standard solutions can not be kept for more than two days and must be stored in plastic containers.

1. Dilute 100 mg/L standard to make 1 mg/L standard. Measure 10 mL of 100 mg/L standard solution using a 100 mL graduated cylinder. Pour this into a 500 mL acid washed beaker. Measure 490 mL of deionized water in a 500 mL graduated cylinder and add to the 500 mL beaker.
2. Follow the PO<sub>4</sub> protocol directions to measure the standard.

3. Record the value of the concentration. It should be within 1 mg/L. If the error is larger, new stock solutions must be made.

#### **Calibration Procedure for Temperature**

1. Prepare a mixture of one part liquid water to one part crushed ice.
2. Allow the ice-water to sit for 10 to 15 minutes.
3. The bulb of the calibration thermometer should then be placed in the bath. Gently move the thermometer around the ice-water bath so that it will be thoroughly cooled. It should read between 0 and 1° C.

#### **Calibration Procedure for TDS**

The standard solution for this calibration should be kept tightly capped and refrigerated. The label on the bottle should include the date on which the solution was prepared or purchased.

1. Remove cap from meter.
2. Line up two 100 ml acid washed beakers and fill each beaker with just enough standard solution to immerse the electrode.
3. Press the on/off button to turn the tester on.
4. Rinse the electrode with deionized water from a squeeze bottle. Do not rinse above the brown line. Blot dry with a soft tissue.
5. Immerse electrode into the first beaker containing standard solution for a second or two. Take the meter out and dip it into the second standard solution without rinsing the electrode.
6. Gently stir for a few seconds, then allow the readout to stabilize.
7. If the display does not read the standard value, you must adjust the instrument to read this value. With a small screwdriver, adjust the calibration screw on the pen until the display reads the standard value.
8. Discard the standard solution that was used in the two beakers. Do not return this solution to the stock solution bottle.
9. Turn the instrument off by pushing the on/off button and let stand for 5 minutes.
10. Pour fresh solution into an acid washed 100 ml beaker.
11. Turn the instrument on by pushing the on/off button and immerse it in the standard solution.
12. Rinse the electrode with deionized water. Blot dry with a soft tissue
13. Immerse the electrode into the standard solution. Stir gently for a few seconds and then let the readout stabilize.
14. Read the output. It must agree within +/- 40 µS/cm or the equivalent TDS concentration range.

## **Appendix D**

### **Monitoring Results**

Table D: Monitoring Data

Well Number	Date vyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW1	20010629	H2O TEMP	21	degrees C		198
GW1	20010629	PH	7.6	pH		198
GW1	20010629	TDS	1060	mg/l		198
GW1	20010629	DO2	3.8	mg/l		198
GW1	20010629	NO3-N	2	mg/l		198
GW1	20010629	ALKALINITY	2	mg/l	u	198
GW1	20010629	PO4	0.5	mg/l	u	198
GW1	20010810	H2O TEMP	17	degrees C	v	198
GW1	20010810	PH	7.9	pH	v	198
GW1	20010810	TDS	380	mg/l	v	198
GW1	20010810	NO3-N	8	mg/l	v	198
GW1	20010810	TOTAL COL	0	coliform	v	198
GW1	20010910	H2O TEMP	14	degrees C		198
GW1	20010910	PH	8	pH		198
GW1	20010910	TDS	880	mg/l		198
GW1	20010910	DO2	9.4	mg/l		198
GW1	20010910	NO3-N	15.5	mg/l		198
GW1	20010910	ALKALINITY	2	mg/l	u	198
GW1	20010910	PO4	0.5	mg/l	u	198
GW1	20011218	H2O TEMP	13	degrees C		198
GW1	20011218	PH	8.6	pH		198
GW1	20011218	TDS	980	mg/l		198
GW1	20011218	DO2	9.8	mg/l		198
GW1	20011218	NO3-N	10	mg/l		198
GW1	20020325	H2O TEMP	14	degrees C		198
GW1	20020325	PH	8.1	pH		198
GW1	20020325	TDS	890	mg/l		198
GW1	20020325	DO2	8.8	mg/l		198
GW1	20020325	NO3-N	15	mg/l		198
GW1	20020513	H2O TEMP	13	degrees C		198
GW1	20020513	PH	9	pH		198
GW1	20020513	TDS	940	mg/l		198
GW1	20020513	DO2	9	mg/l		198
GW1	20020513	NO3-N	16	mg/l		198
GW1	20020625	H2O TEMP	14	degrees C		198
GW1	20020625	PH	9.3	pH		198
GW1	20020625	TDS	860	mg/l		198
GW1	20020625	DO2	8.8	mg/l		198
GW1	20020625	NO3-N	16.5	mg/l		198
GW1	20020625	PO4	0.5	mg/l	u	198
GW1	20020625	FLUORIDE	0.032701	mg/l		198
GW1	20020819	H2O TEMP	13	degrees C		198
GW1	20020819	PH	9.3	pH		198
GW1	20020819	TDS	900	mg/l		198
GW1	20020819	DO2	7.4	mg/l		198
GW1	20020819	NO3-N	14	mg/l		198
GW1	20020819	ALKALINITY	2	mg/l	u	198
GW1	20020819	PO4	0.5	mg/l	u	198
GW1	20020819	FLUORIDE	0.555690	mg/l		198
GW1	20020912	H2O TEMP	15	degrees C		198

Table D: Monitoring Data

Well Number	Date yyyy-mm-dd	Parameter	Measured Value	Units	Qualification	Well Depth
GW1	20020912	PH	9.5	pH		198
GW1	20020912	TDS	840	mg/l		198
GW1	20020912	DO2	8.6	mg/l		198
GW1	20020912	NO3-N	32	mg/l		198
GW1	20020912	ALKALINITY	2	mg/l	u	198
GW1	20020912	PO4	0.5	mg/l	u	198
GW1	20020912	FLUORIDE	1.1	mg/l		198
GW2	20010703	H2O TEMP	13.5	degrees C		
GW2	20010703	PH	8	pH		
GW2	20010703	TDS	550	mg/l		
GW2	20010703	DO2	7.4	mg/l		
GW2	20010703	NO3-N	1	mg/l		
GW2	20010703	ALKALINITY	2	mg/l	u	
GW2	20010703	PO4	0.5	mg/l	u	
GW2	20010810	H2O TEMP	13.5	degrees C	v	
GW2	20010810	PH	8	pH	v	
GW2	20010810	TDS	550	mg/l	v	
GW2	20010810	NO3-N	1	mg/l	v	
GW2	20010810	TOTAL COL	0	coliform	v	
GW2	20010911	H2O TEMP	13	degrees C		
GW2	20010911	PH	8.2	pH		
GW2	20010911	TDS	650	mg/l		
GW2	20010911	DO2	6.6	mg/l		
GW2	20010911	NO3-N	4.5	mg/l		
GW2	20010911	ALKALINITY	2	mg/l	u	
GW2	20010911	PO4	0.5	mg/l	u	
GW2	20020114	H2O TEMP	14	degrees C		
GW2	20020114	PH	8.9	pH		
GW2	20020114	TDS	690	mg/l		
GW2	20020114	NO3-N	3.5	mg/l		
GW2	20020325	H2O TEMP	15	degrees C		
GW2	20020325	PH	8	pH		
GW2	20020325	TDS	620	mg/l		
GW2	20020325	DO2	7.4	mg/l		
GW2	20020325	NO3-N	4	mg/l		
GW2	20020513	H2O TEMP	14	degrees C		
GW2	20020513	PH	9	pH		
GW2	20020513	TDS	650	mg/l		
GW2	20020513	DO2	7.6	mg/l		
GW2	20020513	NO3-N	3	mg/l		
GW2	20020625	H2O TEMP	15	degrees C		
GW2	20020625	PH	9.3	pH		
GW2	20020625	TDS	610	mg/l		
GW2	20020625	DO2	6.6	mg/l		
GW2	20020625	NO3-N	3.33	mg/l		
GW2	20020625	ALKALINITY	2	mg/l	u	
GW2	20020625	PO4	0.5	mg/l	u	
GW2	20020625	FLUORIDE	0.076470	mg/l		
GW2	20020710	H2O TEMP	15	degrees C		
GW2	20020710	PH	9.3	pH		
GW2	20020710	TDS	610	mg/l		

Table D: Monitoring Data (Continued)

Well Number	Date vyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW2	20020710	DO2	6.6	mg/l		
GW2	20020710	NO3-N	3.33	mg/l		
GW2	20020710	ALKALINITY	2	mg/l	u	
GW2	20020710	PO4	0.5	mg/l	u	
GW2	20020710	FLUORIDE	0.084216	mg/l		
GW2	20020917	H2O TEMP	14	degrees C		
GW2	20020917	PH	10.1	pH		
GW2	20020917	TDS	620	mg/l		
GW2	20020917	DO2	7.4	mg/l		
GW2	20020917	NO3-N	5.5	mg/l		
GW2	20020917	ALKALINITY	2	mg/l	u	
GW2	20020917	PO4	0.5	mg/l	u	
GW2	20020917	FLUORIDE	1.4	mg/l		
GW3	20010703	H2O TEMP	15.5	degrees C		
GW3	20010703	PH	7.7	pH		
GW3	20010703	TDS	470	mg/l		
GW3	20010703	DO2	7.8	mg/l		
GW3	20010703	NO3-N	2	mg/l		
GW3	20010703	ALKALINITY	2	mg/l	u	
GW3	20010703	PO4	0.5	mg/l	u	
GW3	20010810	H2O TEMP	15.5	degrees C	v	
GW3	20010810	PH	7.7	pH	v	
GW3	20010810	TDS	470	mg/l	v	
GW3	20010810	NO3-N	2	mg/l	v	
GW3	20010810	TOTAL COL	0	coliform	v	
GW3	20010911	H2O TEMP	14	degrees C		
GW3	20010911	PH	8.2	pH		
GW3	20010911	TDS	500	mg/l		
GW3	20010911	DO2	7.8	mg/l		
GW3	20010911	NO3-N	4.5	mg/l		
GW3	20010911	ALKALINITY	2	mg/l	u	
GW3	20010911	PO4	0.5	mg/l	u	
GW3	20020620	H2O TEMP	13	degrees C		
GW3	20020620	PH	8.9	pH		
GW3	20020620	TDS	520	mg/l		
GW3	20020620	DO2	8.4	mg/l		
GW3	20020620	NO3-N	8	mg/l		
GW3	20020620	ALKALINITY	2	mg/l	u	
GW3	20020620	PO4	0.5	mg/l	u	
GW3	20020620	FLUORIDE	0.076470	mg/l		
GW3	20020917	H2O TEMP	14	degrees C		
GW3	20020917	PH	10.3	pH		
GW3	20020917	TDS	520	mg/l		
GW3	20020917	DO2	7	mg/l		
GW3	20020917	NO3-N	6.6	mg/l		
GW3	20020917	ALKALINITY	2	mg/l	u	
GW3	20020917	PO4	0.5	mg/l	u	
GW3	20020917	FLUORIDE	1.8	mg/l		
GW4	20010703	H2O TEMP	16.5	degrees C		150
GW4	20010703	PH	7.6	pH		150
GW4	20010703	TDS	490	mg/l		150

Table D: Monitoring Data (Continued)

Well Number	Date yyyy-mm-dd	Parameter	Measured Value	Units	Qualification	Well Depth
GW4	20010703	DO2	6.4	mg/l		150
GW4	20010703	NO3-N	3	mg/l		150
GW4	20010703	ALKALINITY	2	mg/l	u	150
GW4	20010703	PO4	0.5	mg/l	u	150
GW4	20010810	H2O TEMP	16.5	degrees C	v	150
GW4	20010810	pH	7.6	pH	v	150
GW4	20010810	TDS	490	mg/l	v	150
GW4	20010810	NO3-N	3	mg/l	v	150
GW4	20010810	TOTAL COL	0	coliform	v	150
GW4	20010911	H2O TEMP	13	degrees C		150
GW4	20010911	pH	8	pH		150
GW4	20010911	TDS	500	mg/l		150
GW4	20010911	DO2	7	mg/l		150
GW4	20010911	NO3-N	4.5	mg/l		150
GW4	20010911	ALKALINITY	2	mg/l	u	150
GW4	20010911	PO4	0.5	mg/l	u	150
GW4	20020312	H2O TEMP	13	degrees C		150
GW4	20020312	pH	8.4	pH		150
GW4	20020312	TDS	560	mg/l		150
GW4	20020312	DO2	8.6	mg/l		150
GW4	20020312	NO3-N	10.6	mg/l		150
GW4	20020325	H2O TEMP	15	degrees C		150
GW4	20020325	TDS	490	mg/l		150
GW4	20020325	DO2	7	mg/l		150
GW4	20020325	NO3-N	6.3	mg/l		150
GW4	20020521	H2O TEMP	14	degrees C		150
GW4	20020521	pH	8.6	pH		150
GW4	20020521	TDS	530	mg/l		150
GW4	20020521	DO2	5.8	mg/l		150
GW4	20020521	NO3-N	5	mg/l		150
GW4	20020620	H2O TEMP	19	degrees C		150
GW4	20020620	pH	8.9	pH		150
GW4	20020620	TDS	570	mg/l		150
GW4	20020620	DO2	5	mg/l		150
GW4	20020620	NO3-N	7.33	mg/l		150
GW4	20020620	ALKALINITY	2	mg/l	u	150
GW4	20020620	PO4	0.5	mg/l	u	150
GW4	20020620	FLUORIDE	0.039105	mg/l		150
GW4	20020724	H2O TEMP	15	degrees C		150
GW4	20020724	pH	9.8	pH		150
GW4	20020724	TDS	500	mg/l		150
GW4	20020724	DO2	5	mg/l		150
GW4	20020724	NO3-N	7.33	mg/l		150
GW4	20020724	ALKALINITY	2	mg/l		150
GW4	20020724	PO4	0.5	mg/l		150
GW4	20020724	FLUORIDE	0.053306	mg/l		150
GW4	20020812	H2O TEMP	15	degrees C		150
GW4	20020812	pH	9.5	pH		150
GW4	20020812	TDS	440	mg/l		150
GW4	20020812	DO2	6.6	mg/l		150
GW4	20020812	NO3-N	3.3	mg/l		150

Table D: Monitoring Data (Continued)

Well Number	Date vvvvmmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW4	20020812	ALKALINITY	2	mg/l		150
GW4	20020812	PO4	0.5	mg/l		150
GW4	20020812	FLUORIDE	0.065607	mg/l		150
GW5	20010703	H2O TEMP	15	degrees C		120
GW5	20010703	PH	8	pH		120
GW5	20010703	TDS	290	mg/l		120
GW5	20010703	DO2	7.6	mg/l		120
GW5	20010703	NO3-N	1	mg/l		120
GW5	20010703	ALKALINITY	2	mg/l	u	120
GW5	20010703	PO4	0.5	mg/l	u	120
GW5	20010810	H2O TEMP	15	degrees C	v	120
GW5	20010810	PH	8	pH	v	120
GW5	20010810	TDS	290	mg/l	v	120
GW5	20010810	NO3-N	2	mg/l	v	120
GW5	20010810	TOTAL COL	0	coliform	v	120
GW5	20010913	H2O TEMP	14	degrees C		120
GW5	20010913	PH	8.4	pH		120
GW5	20010913	TDS	310	mg/l		120
GW5	20010913	DO2	6	mg/l		120
GW5	20010913	NO3-N	1	mg/l		120
GW5	20010913	ALKALINITY	2	mg/l	u	120
GW5	20010913	PO4	0.5	mg/l	u	120
GW5	20020402	H2O TEMP	14	degrees C		120
GW5	20020402	PH	7.8	pH		120
GW5	20020402	TDS	310	mg/l		120
GW5	20020402	DO2	8.2	mg/l		120
GW5	20020402	NO3-N	2	mg/l		120
GW5	20020524	H2O TEMP	13	degrees C		120
GW5	20020524	PH	8.6	pH		120
GW5	20020524	TDS	300	mg/l		120
GW5	20020524	DO2	8.2	mg/l		120
GW5	20020524	NO3-N	1.3	mg/l		120
GW5	20020620	H2O TEMP	14	degrees C		120
GW5	20020620	PH	9.5	pH		120
GW5	20020620	TDS	290	mg/l		120
GW5	20020620	DO2	7.2	mg/l		120
GW5	20020620	NO3-N	1	mg/l		120
GW5	20020620	ALKALINITY	2	mg/l	u	120
GW5	20020620	PO4	0.5	mg/l	u	120
GW5	20020620	FLUORIDE	0.087447	mg/l		120
GW5	20020710	H2O TEMP	14	degrees C		120
GW5	20020710	PH	9.3	pH		120
GW5	20020710	TDS	320	mg/l		120
GW5	20020710	DO2	8.8	mg/l		120
GW5	20020710	NO3-N	1	mg/l		120
GW5	20020710	ALKALINITY	2	mg/l	u	120
GW5	20020710	PO4	0.5	mg/l	u	120
GW5	20020710	FLUORIDE	0.117961	mg/l		120
GW5	20020819	H2O TEMP	14	degrees C		120
GW5	20020819	PH	9.3	pH		120
GW5	20020819	TDS	320	mg/l		120

Table D: Monitoring Data (Continued)

Well Number	Date yyyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW5	20020819	DO2	8.8	mg/l		120
GW5	20020819	NO3-N	1	mg/l		120
GW5	20020819	ALKALINITY	2	mg/l	u	120
GW5	20020819	PO4	0.5	mg/l	u	120
GW5	20020819	FLUORIDE	0.249388	mg/l		120
GW5	20020917	H2O TEMP	14	degrees C		120
GW5	20020917	PH	10.1	pH		120
GW5	20020917	TDS	310	mg/l		120
GW5	20020917	DO2	7.2	mg/l		120
GW5	20020917	NO3-N	1	mg/l		120
GW5	20020917	ALKALINITY	2	mg/l	u	120
GW5	20020917	PO4	0.5	mg/l	u	120
GW5	20020917	FLUORIDE	1.4	mg/l		120
GW6	20010705	H2O TEMP	13	degrees C		
GW6	20010705	PH	8.1	pH		
GW6	20010705	TDS	390	mg/l		
GW6	20010705	DO2	6	mg/l		
GW6	20010705	NO3-N	1	mg/l		
GW6	20010705	ALKALINITY	2	mg/l	u	
GW6	20010705	PO4	0.5	mg/l	u	
GW6	20010810	H2O TEMP	13	degrees C	v	
GW6	20010810	PH	8.1	pH	v	
GW6	20010810	TDS	390	mg/l	v	
GW6	20010810	NO3-N	6	mg/l	v	
GW6	20010810	TOTAL COL	0	coliform	v	
GW6	20010911	H2O TEMP	13.5	degrees C		
GW6	20010911	PH	8.1	pH		
GW6	20010911	TDS	390	mg/l		
GW6	20010911	DO2	7	mg/l		
GW6	20010911	NO3-N	3.3	mg/l		
GW6	20010911	ALKALINITY	2	mg/l	u	
GW6	20010911	PO4	0.5	mg/l	u	
GW6	20020403	H2O TEMP	14	degrees C		
GW6	20020403	PH	7.9	pH		
GW6	20020403	TDS	450	mg/l		
GW6	20020403	DO2	7.4	mg/l		
GW6	20020403	NO3-N	3.3	mg/l		
GW6	20020528	H2O TEMP	14	degrees C		
GW6	20020528	PH	8.4	pH		
GW6	20020528	TDS	380	mg/l		
GW6	20020528	DO2	7.8	mg/l		
GW6	20020528	NO3-N	4	mg/l		
GW6	20020618	H2O TEMP	12	degrees C		
GW6	20020618	PH	9.2	pH		
GW6	20020618	TDS	450	mg/l		
GW6	20020618	DO2	7.4	mg/l		
GW6	20020618	NO3-N	1.6	mg/l		
GW6	20020618	ALKALINITY	2	mg/l	u	
GW6	20020618	PO4	0.5	mg/l	u	
GW6	20020618	FLUORIDE	2.535091	mg/l		
GW6	20020731	H2O TEMP	14	degrees C		

Table D: Monitoring Data (Continued)

Well Number	Date yyyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW6	20020731	DO2	8.2	mg/l		
GW6	20020731	NO3-N	2.33	mg/l		
GW6	20020731	ALKALINITY	2	mg/l	u	
GW6	20020731	PO4	0.5	mg/l	u	
GW6	20020731	FLUORIDE	0.126794	mg/l		
GW6	20020731	PH	9.1	pH		
GW6	20020731	TDS	430	mg/l		
GW6	20020826	FLUORIDE	0.725801	mg/l		
GW7	20010705	E20_TEMP	13	degrees C		
GW7	20010705	PH	7.9	pH		
GW7	20010705	TDS	390	mg/l		
GW7	20010705	DO2	9.2	mg/l		
GW7	20010705	NO3-N	1	mg/l		
GW7	20010705	ALKALINITY	2	mg/l	u	
GW7	20010705	PO4	0.5	mg/l	u	
GW7	20010810	H20_TEMP	13	degrees C	v	
GW7	20010810	PH	7.9	pH	v	
GW7	20010810	TDS	390	mg/l	v	
GW7	20010810	NO3-N	1	mg/l	v	
GW7	20010810	TOTAL_COL	0	coliform	v	
GW7	20010913	H20_TEMP	13	degrees C		
GW7	20010913	PH	8.1	pH		
GW7	20010913	TDS	350	mg/l		
GW7	20010913	DO2	8.8	mg/l		
GW7	20010913	NO3-N	1	mg/l		
GW7	20010913	ALKALINITY	2	mg/l	u	
GW7	20010913	PO4	0.5	mg/l	u	
GW7	20020403	H20_TEMP	14	degrees C		
GW7	20020403	PH	7.9	pH		
GW7	20020403	TDS	450	mg/l		
GW7	20020403	DO2	7.4	mg/l		
GW7	20020403	NO3-N	3.3	mg/l		
GW8	20010705	H20_TEMP	16	degrees C		
GW8	20010705	PH	7.5	pH		
GW8	20010705	TDS	850	mg/l		
GW8	20010705	DO2	5.2	mg/l		
GW8	20010705	NO3-N	2	mg/l		
GW8	20010705	ALKALINITY	2	mg/l	u	
GW8	20010705	PO4	0.5	mg/l	u	
GW8	20010811	H20_TEMP	16	degrees C	v	
GW8	20010811	PH	7.5	pH	v	
GW8	20010811	TDS	850	mg/l	v	
GW8	20010811	NO3-N	2	mg/l	v	
GW8	20010811	TOTAL_COL	0	coliform	v	
GW8	20010913	H20_TEMP	15	degrees C		
GW8	20010913	PH	8.1	pH		
GW8	20010913	TDS	1000	mg/l		
GW8	20010913	DO2	5.8	mg/l		
GW8	20010913	NO3-N	9	mg/l		
GW8	20010913	ALKALINITY	2	mg/l	u	
GW8	20010913	PO4	0.5	mg/l	u	
GW8	20020403	H20_TEMP	10	degrees C		

Table D: Monitoring Data (Continued)

Well Number	Date yyyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW8	20020403	PH	8.2	pH		
GW8	20020403	TDS	850	mg/l		
GW8	20020403	DO2	5	mg/l		
GW8	20020403	NO3-N	12.6	mg/l		
GW8	20020528	H2O TEMP	14	degrees C		
GW8	20020528	PH	8.8	pH		
GW8	20020528	TDS	1020	mg/l		
GW8	20020528	DO2	5.2	mg/l		
GW8	20020528	NO3-N	9.3	mg/l		
GW8	20020612	H2O TEMP	14	degrees C		
GW8	20020612	PH	9.4	pH		
GW8	20020612	TDS	980	mg/l		
GW8	20020612	DO2	5.2	mg/l		
GW8	20020612	NO3-N	10	mg/l		
GW8	20020612	ALKALINITY	2	mg/l	u	
GW8	20020612	PO4	0.5	mg/l	u	
GW8	20020612	FLUORIDE	1.681545	mg/l		
GW8	20020717	H2O TEMP	15	degrees C		
GW8	20020717	PH	10.1	pH		
GW8	20020717	TDS	1010	mg/l		
GW8	20020717	DO2	5.6	mg/l		
GW8	20020717	NO3-N	14	mg/l		
GW8	20020717	ALKALINITY	2	mg/l	u	
GW8	20020717	PO4	0.5	mg/l	u	
GW8	20020717	FLUORIDE	0.090522	mg/l		
GW8	20020820	H2O TEMP	14	degrees C		
GW8	20020820	PH	9.3	pH		
GW8	20020820	TDS	10.3	mg/l		
GW8	20020820	DO2	5.4	mg/l		
GW8	20020820	NO3-N	14	mg/l		
GW8	20020820	ALKALINITY	2	mg/l	u	
GW8	20020820	PO4	0.5	mg/l	u	
GW8	20020820	FLUORIDE	0.249388	mg/l		
GW9	20010705	H2O TEMP	17	degrees C		
GW9	20010705	PH	7.8	pH		
GW9	20010705	TDS	390	mg/l		
GW9	20010705	DO2	2.8	mg/l		
GW9	20010705	NO3-N	1	mg/l		
GW9	20010705	ALKALINITY	2	mg/l	u	
GW9	20010705	PO4	0.5	mg/l	u	
GW9	20010810	TOTAL COL	1	coliform	v	
GW9	20010811	H2O TEMP	17	degrees C	v	
GW9	20010811	PH	7.8	pH	v	
GW9	20010811	TDS	390	mg/l	v	
GW9	20010811	NO3-N	4	mg/l	v	
GW9	20010906	H2O TEMP	14	degrees C		
GW9	20010906	PH	8.2	pH		
GW9	20010906	TDS	420	mg/l		
GW9	20010906	DO2	4.4	mg/l		
GW9	20010906	NO3-N	7.3	mg/l		
GW9	20010906	ALKALINITY	2	mg/l	u	

Table D: Monitoring Data (Continued)

Well Number	Date yyyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW9	20010906	PO4	0.5	mg/l	u	
GW9	20020401	H20 TEMP	14	degrees C		
GW9	20020401	PH	8.4	pH		
GW9	20020401	TDS	450	mg/l		
GW9	20020401	DO2	3.8	mg/l		
GW9	20020401	NO3-N	8.6	mg/l		
GW9	20020523	H20 TEMP	13	degrees C		
GW9	20020523	PH	8.8	pH		
GW9	20020523	TDS	430	mg/l		
GW9	20020523	DO2	4.6	mg/l		
GW9	20020523	NO3-N	11.3	mg/l		
GW9	20010730	H20 TEMP	14	degrees C		
GW9	20010730	PH	9.6	pH		
GW9	20010730	TDS	460	mg/l		
GW9	20010730	DO2	4.8	mg/l		
GW9	20010730	NO3-N	10	mg/l		
GW9	20010730	ALKALINITY	2	mg/l	u	
GW9	20010730	PO4	0.5	mg/l	u	
GW9	20010730	FLUORIDE	0.133048	mg/l		
GW9	20010813	H20 TEMP	14	degrees C		
GW9	20010813	PH	4.6	pH		
GW9	20010813	TDS	460	mg/l		
GW9	20010813	DO2	6	mg/l		
GW9	20010813	NO3-N	6	mg/l		
GW9	20010813	ALKALINITY	2	mg/l	u	
GW9	20010813	PO4	0.5	mg/l	u	
GW9	20010813	FLUORIDE	0.555690	mg/l		
GW9	20021008	H20 TEMP	14	degrees C		
GW9	20021008	PH	10	pH		
GW9	20021008	TDS	500	mg/l		
GW9	20021008	DO2	5	mg/l		
GW9	20021008	NO3-N	10.6	mg/l		
GW9	20021008	ALKALINITY	2	mg/l	u	
GW9	20021008	PO4	0.5	mg/l	u	
GW9	20021008	FLUORIDE	1.1	mg/l		
GW10	20010705	H20 TEMP	16	degrees C		200
GW10	20010705	PH	7.7	pH		200
GW10	20010705	TDS	480	mg/l		200
GW10	20010705	DO2	4	mg/l		200
GW10	20010705	NO3-N	1	mg/l		200
GW10	20010705	ALKALINITY	2	mg/l	u	200
GW10	20010705	PO4	0.5	mg/l	u	200
GW10	20010810	TOTAL COL	0	coliform	v	200
GW10	20010811	H20 TEMP	16	degrees C	v	200
GW10	20010811	PH	7.7	pH	v	200
GW10	20010811	TDS	480	mg/l	v	200
GW10	20010811	NO3-N	1	mg/l	v	200
GW10	20011004	H20 TEMP	14	degrees C		200
GW10	20011004	PH	8.6	pH		200
GW10	20011004	TDS	580	mg/l		200
GW10	20011004	DO2	4.8	mg/l		200

Table D: Monitoring Data (Continued)

Well Number	Date yyyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW10	20011004	NO3-N	4	mg/l		200
GW10	20011004	ALKALINITY	2	mg/l	u	200
GW10	20011004	PO4	0.5	mg/l	u	200
GW10	20020115	H2O TEMP	13	degrees C		200
GW10	20020115	PH	8.4	pH		200
GW10	20020115	TDS	710	mg/l		200
GW10	20020115	DO2	4.2	mg/l		200
GW10	20020115	NO3-N	3.3	mg/l		200
GW10	20020401	H2O TEMP	13	degrees C		200
GW10	20020401	PH	8.1	pH		200
GW10	20020401	TDS	700	mg/l		200
GW10	20020401	DO2	5.4	mg/l		200
GW10	20020401	NO3-N	5.3	mg/l		200
GW10	20020514	H2O TEMP	13	degrees C		200
GW10	20020514	PH	8.4	pH		200
GW10	20020514	TDS	620	mg/l		200
GW10	20020514	DO2	5.2	mg/l		200
GW10	20020514	NO3-N	4	mg/l		200
GW10	20020514	ALKALINITY	4	mg/l		200
GW10	20020618	H2O TEMP	14	degrees C		200
GW10	20020618	PH	9.2	pH		200
GW10	20020618	TDS	600	mg/l		200
GW10	20020618	DO2	5.4	mg/l		200
GW10	20020618	NO3-N	4.6	mg/l		200
GW10	20020618	ALKALINITY	2	mg/l	u	200
GW10	20020618	PO4	0.5	mg/l	u	200
GW10	20020618	FLUORIDE	1.314430	mg/l		200
GW10	20020730	H2O TEMP	14	degrees C		200
GW10	20020730	PH	9.5	pH		200
GW10	20020730	TDS	550	mg/l		200
GW10	20020730	DO2	4.2	mg/l		200
GW10	20020730	NO3-N	6.66	mg/l		200
GW10	20020730	ALKALINITY	2	mg/l	u	200
GW10	20020730	PO4	0.5	mg/l	u	200
GW10	20020730	FLUORIDE	0.231438	mg/l		200
GW10	20020813	H2O TEMP	14	degrees C		200
GW10	20020813	PH	9.5	pH		200
GW10	20020813	TDS	570	mg/l		200
GW10	20020813	DO2	4.2	mg/l		200
GW10	20020813	NO3-N	5.3	mg/l		200
GW10	20020813	ALKALINITY	2	mg/l	u	200
GW10	20020813	PO4	0.5	mg/l	u	200
GW10	20020813	FLUORIDE	0.555690	mg/l		200
GW11	20010705	H2O TEMP	14	degrees C		
GW11	20010705	PH	7.8	pH		
GW11	20010705	TDS	490	mg/l		
GW11	20010705	DO2	3.8	mg/l		
GW11	20010705	NO3-N	2	mg/l		
GW11	20010705	ALKALINITY	2	mg/l	u	
GW11	20010705	PO4	0.5	mg/l	u	
GW11	20010810	TOTAL COL	0	coliform	v	

Table D: Monitoring Data (Continued)

Well Number	Date yyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW11	20010811	H2O TEMP	14	degrees C	v	
GW11	20010811	PH	7.8	pH	v	
GW11	20010811	TDS	490	mg/l	v	
GW11	20010811	NO3-N	2	mg/l	v	
GW11	20011004	H2O TEMP	14	degrees C		
GW11	20011004	PH	8.5	pH		
GW11	20011004	TDS	580	mg/l		
GW11	20011004	DO2	4.8	mg/l		
GW11	20011004	NO3-N	6.6	mg/l		
GW11	20011004	ALKALINITY	2	mg/l	u	
GW11	20011004	PO4	0.5	mg/l	u	
GW11	20020314	H2O TEMP	12	degrees C		
GW11	20020314	PH	8.1	pH		
GW11	20020314	TDS	630	mg/l		
GW11	20020314	DO2	3.6	mg/l		
GW11	20020314	NO3-N	6.6	mg/l		
GW11	20020403	H2O TEMP	13	degrees C		
GW11	20020403	PH	7.5	pH		
GW11	20020403	TDS	560	mg/l		
GW11	20020403	DO2	4.6	mg/l		
GW11	20020403	NO3-N	8.6	mg/l		
GW11	20020523	H2O TEMP	13	degrees C		
GW11	20020523	PH	8.2	pH		
GW11	20020523	TDS	590	mg/l		
GW11	20020523	DO2	3.4	mg/l		
GW11	20020523	NO3-N	8.6	mg/l		
GW11	20020618	H2O TEMP	14	degrees C		
GW11	20020618	PH	9.1	pH		
GW11	20020618	TDS	490	mg/l		
GW11	20020618	DO2	4.4	mg/l		
GW11	20020618	NO3-N	6.6	mg/l		
GW11	20020618	ALKALINITY	2	mg/l	u	
GW11	20020618	PO4	0.5	mg/l	u	
GW11	20020618	FLUORIDE	1.314430	mg/l		
GW11	20020730	H2O TEMP	14	degrees C		
GW11	20020730	PH	9.6	pH		
GW11	20020730	TDS	530	mg/l		
GW11	20020730	DO2	3.6	mg/l		
GW11	20020730	NO3-N	8.66	mg/l		
GW11	20020730	ALKALINITY	2	mg/l	u	
GW11	20020730	PO4	0.5	mg/l	u	
GW11	20020730	FLUORIDE	0.195552	mg/l		
GW11	20020813	H2O TEMP	15	degrees C		
GW11	20020813	PH	9.3	pH		
GW11	20020813	TDS	560	mg/l		
GW11	20020813	DO2	4	mg/l		
GW11	20020813	NO3-N	5.3	mg/l		
GW11	20020813	ALKALINITY	2	mg/l	u	
GW11	20020813	PO4	0.5	mg/l	u	
GW11	20020813	FLUORIDE	1.238192	mg/l		
GW11	20021008	H2O TEMP	14	degrees C		

Table D. Monitoring Data (Continued)

Well Number	Date vyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW11	20021008	PH	10	pH		
GW11	20021008	TDS	540	mg/l		
GW11	20021008	DO2	7.2	mg/l		
GW11	20021008	NO3-N	8.6	mg/l		
GW11	20021008	ALKALINITY	2	mg/l	u	
GW11	20021008	PO4	0.5	mg/l	u	
GW11	20021008	FLUORIDE	1.1	mg/l		
GW12	20010705	H2O TEMP	13	degrees C		130
GW12	20010705	PH	7.6	pH		130
GW12	20010705	TDS	520	mg/l		130
GW12	20010705	DO2	4.6	mg/l		130
GW12	20010705	NO3-N	1	mg/l		130
GW12	20010705	ALKALINITY	2	mg/l	u	130
GW12	20010705	PO4	0.5	mg/l	u	130
GW12	20010810	TOTAL COL	0	coliform	v	130
GW12	20010811	H2O TEMP	13	degrees C	v	130
GW12	20010811	PH	7.6	pH	v	130
GW12	20010811	TDS	520	mg/l	v	130
GW12	20010811	NO3-N	1	mg/l	v	130
GW12	20011004	H2O TEMP	14	degrees C		130
GW12	20011004	PH	8.2	pH		130
GW12	20011004	TDS	520	mg/l		130
GW12	20011004	DO2	5.4	mg/l		130
GW12	20011004	NO3-N	3.7	mg/l		130
GW12	20011004	ALKALINITY	2	mg/l	u	130
GW12	20011004	PO4	0.5	mg/l	u	130
GW12	20020314	H2O TEMP	13	degrees C		130
GW12	20020314	PH	7.9	pH		130
GW12	20020314	TDS	580	mg/l		130
GW12	20020314	DO2	5	mg/l		130
GW12	20020403	H2O TEMP	14	degrees C		130
GW12	20020403	PH	7.6	pH		130
GW12	20020403	TDS	560	mg/l		130
GW12	20020403	DO2	5.4	mg/l		130
GW12	20020403	NO3-N	3	mg/l		130
GW12	20020412	H2O TEMP	14	degrees C		130
GW12	20020412	PH	7.6	pH		130
GW12	20020412	TDS	560	mg/l		130
GW12	20020412	DO2	5.4	mg/l		130
GW12	20020412	NO3-N	3	mg/l		130
GW12	20020523	H2O TEMP	13	degrees C		130
GW12	20020523	PH	8.4	pH		130
GW12	20020523	TDS	630	mg/l		130
GW12	20020523	DO2	4.6	mg/l		130
GW12	20020523	NO3-N	3.3	mg/l		130
GW12	20020618	H2O TEMP	14	degrees C		130
GW12	20020618	PH	8.9	pH		130
GW12	20020618	TDS	580	mg/l		130
GW12	20020618	DO2	4.2	mg/l		130
GW12	20020618	NO3-N	3	mg/l		130
GW12	20020618	ALKALINITY	2	mg/l	u	130

Table D: Monitoring Data (Continued)

Well Number	Date yyyymmdd	Parameter	Measured Value	Units	Qualification	Well Depth
GW12	20020618	PO4	0.5	mg/l	u	130
GW12	20020618	FLUORIDE	1.186223	mg/l		130
GW13	20010705	H2O TEMP	16	degrees C		
GW13	20010705	PH	7.8	pH		
GW13	20010705	TDS	480	mg/l		
GW13	20010705	DO2	5.4	mg/l		
GW13	20010705	NO3-N	1	mg/l		
GW13	20010705	ALKALINITY	2	mg/l	u	
GW13	20010705	PO4	0.5	mg/l	u	
GW13	20010810	TOTAL COL	0	coliform	v	
GW13	20010811	H2O TEMP	16	degrees C	v	
GW13	20010811	PH	7.8	pH	v	
GW13	20010811	TDS	480	mg/l	v	
GW13	20011004	NO3-N	1	mg/l	v	
GW13	20011004	H2O TEMP	13	degrees C		
GW13	20011004	PH	8.2	pH		
GW13	20011004	TDS	520	mg/l		
GW13	20011004	DO2	4.8	mg/l		
GW13	20011004	NO3-N	2	mg/l		
GW13	20011004	ALKALINITY	2	mg/l	u	
GW13	20011004	PO4	0.5	mg/l	u	
GW13	20020314	H2O TEMP	13	degrees C		
GW13	20020314	PH	8.2	pH		
GW13	20020314	TDS	540	mg/l		
GW13	20020314	DO2	4.4	mg/l		
GW13	20020314	NO3-N	2.3	mg/l		
GW13	20020401	H2O TEMP	13	degrees C		
GW13	20020401	PH	7.5	pH		
GW13	20020401	TDS	520	mg/l		
GW13	20020401	DO2	4	mg/l		
GW13	20020401	NO3-N	2	mg/l		
GW13	20020403	H2O TEMP	13	degrees C		
GW13	20020403	PH	7.5	pH		
GW13	20020403	TDS	220	mg/l		
GW13	20020403	DO2	4	mg/l		
GW13	20020403	NO3-N	2	mg/l		
GW13	20020523	H2O TEMP	12	degrees C		
GW13	20020523	PH	8.6	pH		
GW13	20020523	TDS	660	mg/l		
GW13	20020523	DO2	4	mg/l		
GW13	20020523	NO3-N	2	mg/l		
GW13	20020618	H2O TEMP	13	degrees C		
GW13	20020618	PH	9.4	pH		
GW13	20020618	TDS	520	mg/l		
GW13	20020618	DO2	4	mg/l		
GW13	20020618	NO3-N	3	mg/l		
GW13	20020618	ALKALINITY	2	mg/l	u	
GW13	20020618	PO4	0.5	mg/l	u	
GW13	20020618	FLUORIDE	2.107489	mg/l		
GW13	20020724	H2O TEMP	14	degrees C		
GW13	20020724	PH	9.7	pH		